

**A CRITICAL REVIEW OF A PUBLISHED CASE REPORT THAT INCORRECTLY  
ATTRIBUTED CHIROPRACTIC CARE AS A CAUSE OF VERTEBRAL ARTERY  
DISSECTION (VAD)**

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**ABSTRACT**

Case reports are sometimes published regarding a possible association between chiropractic and cervical artery dissection (CAD). However, case reports that are poorly written or have significant omissions or weaknesses, may lead to incorrect conclusions in relation to the cause of the CAD and potential negligence.

It is important to review the issues and assess the evidence for and against chiropractic manipulation as a trigger for CAD. Using a recently published case study to highlight weaknesses and omissions in such reports. A case report is reviewed in detail and discusses the evidence assessing chiropractic manipulation as a potential trigger for CAD.

**KEY WORDS:**

Cervical artery dissection, Vertebral artery dissection, spinal manipulation, chiropractic

**INTRODUCTION**

Cervical artery dissection (CAD) is dissection of one of the layers of the artery wall that compose the carotid and vertebral artery in the neck.[1] It is a term that can represent either carotid artery dissection (internal carotid artery dissection (ICAD) or external carotid artery dissection ECAD) or vertebral artery dissection (VAD). Common forms of CAD are the ICAD and the VAD.[1] CAD can be either a separation of one of the artery wall layers, or the creation of a flap-like tear in the inner layer of the artery wall. CAD is a rare event, with an annual incidence of approx. 3.6 per 100,000 population.[1,2] One type of CAD, internal carotid artery dissection (ICAD) is estimated to occur at 2.6 per 100,000 population. The subject of this report is CAD that is specifically due to vertebral artery dissection (VAD), estimated to occur at 1 per 100,000 population.[3]

Most cases of CAD are described as spontaneous with no obvious cause.[4] However, some cases of VAD have been reported after minor activities prior to the onset of the VAD.[5,6] This includes many sports such as golf, tennis, swimming, scuba, gym, karate; hobbies including dancing and water slide riding; activities of daily living including painting a ceiling, hair dresser visits, seeing a dentist; and minor trauma such as a low speed MVA.[7-16] Many case reports do not give any substantive details on events prior to the onset of first symptoms of VAD (such as neck pain or headache).[17]

Some people with spontaneous CAD appeared healthy and were also young (<45 yrs old).[18] In addition, cases of VAD have even been reported in children, which usually relates to sport or trivial trauma. [19] Stroke appears to occur in a small proportion of cases with CAD, and it is estimated that CAD accounts for only two percent of all ischemic strokes.[4]

Despite the rarity of CAD, case reports of CAD purportedly due to SMT are often published.[20] Unfortunately, sometimes case reports of CAD following SMT are incorrect by using the term “chiropractor” when the person giving the SMT was not a qualified chiropractor.[21,22] This may include laymen, massage therapists, physiotherapists or orthopaedic specialists.[23-25]

VAD has been highlighted as a risk of chiropractic SMT, due to a theory based on damage to the vertebral artery occurring around the 2nd cervical vertebrae (denoted the V3 segment of the vertebral artery). In addition, case reports of internal carotid artery dissection (ICAD) following SMT have been published, although a mechanism for ICAD damage by SMT is controversial.[26] Several studies report minimal risk of CAD after chiropractic SMT.[27,28]

However, many case reports of SMT and CAD also have significant omissions, errors and flaws, which reduce any appropriate discussion of SMT significantly.[29,30] Case report numbers may be exaggerated due to a perception that SMT increases the possibility of CAD.[31] There is also a perception that chiropractors may be poor at diagnosing the signs and symptoms of CAD or potential contra-indications for SMT.[32]

This paper reviews a recent peer reviewed case report in detail and discusses the evidence assessing chiropractic as a trigger for CAD.

## **CASE REPORT**

A 2021 case report by Lindsay et al. describes a case of Vertebral Artery Dissection (VAD) in a 47 year old male who presented to a USA hospital with headache, pain on the left side of the neck, numbness on the left side of the face, and dizziness.[33] This published case report follows previous published reports that also purported tenuous attribution of causation of VAD with chiropractic management.[29,30,34,35]

As an initial observation, the clinical history as reported by Lindsey et al is ambiguous in key areas including that this patient had experienced a prior similar episode that preceded the current episode. Lindsey et al did not report important clinical details about the earlier episode (such as suspected trigger or diagnosed cause for the head/neck pain), which could be critical to determining whether this case was more likely spontaneous VAD, or due to a minor activity being the final event before the artery finally dissected.[36,37] Many published case reports describe minor activities prior to the onset of the VAD,[5,6] including sports, hobbies, activities of daily living, or low speed MVA,[7-16] none of which were discussed by Lindsay et al to better contextualize how frequently such events precede a VAD, .[5]

Much of the clinical history needed for a clear diagnosis of the Lindsey et al case is not reported. The inclusion of important clinical history factors should help clarify the

relationship of the treatment with the associated adverse event. These include the timing and duration of the patient's symptoms before, during, and after the chiropractic care received six years prior. Before receiving chiropractic care, did the patient already have "headache, pain on the left side of the neck, numbness on the left side of the face, and dizziness", and if so, how long had any headache, neck pain, numbness, and dizziness been present, prior to the chiropractic treatment? When or how did these symptoms commence? What did the chiropractic treatment entail? Did the headache, neck pain, numbness, or dizziness change during the course of care, or after the chiropractic treatment was concluded? What risk factors (smoking, obesity, hypertension, hyperlipidemia, migraine, recent fever, etc) for VAD or stroke were present at the first episode or recent events.[3] Additional questions about the temporal nature of symptoms should also have been presented including the presence of new or changed symptoms. It is unknown whether symptoms were altered by the Ibuprofen use and how long was it used and at what dosage. This information is pertinent as Ibuprofen is a well reported risk factor for stroke.[38,39] Unfortunately, these key issues were not discussed in this case report.[40,41]

Most significantly documented in the case report, there was no evidence of VAD in the preceding event six years prior. As reported by Dr Yoon (page 1317, paragraph 3): "*CT imaging revealed no arterial dissection, aneurysm, stenosis, or thrombotic occlusion.*"

In the absence of clinical evidence, Lindsey et al present a sparse clinical history to solely focus on chiropractic as causative of the patient's stroke, while disregarding the equally likely hypothesis that the patient had a stroke due to the ibuprofen use. See table 1. A more accurate case report should have stated that the patient had a minor stroke due to an undetermined but likely vascular mechanism. We find out much later in the case report, that the patient had a connective tissue disorder, which is a clear risk for developing a VAD.[42]

After this first event, the patient had further care at another hospital. Therefore, using the same prior logic, we could deduce that hospital care causes VAD! However, clinicians should be aware of protopathic bias.

Protopathic bias arises when the initiation of a drug (exposure) occurs in response to a symptom of the (at this point undiagnosed) disease under study (outcome). For example, use of analgesics in response to pain caused by an undiagnosed tumour might lead to the erroneous conclusion that the analgesic caused the tumour. Protopathic bias thus reflects a reversal of cause and effect.[43]

From the description of the current presentation, the patient had presented with a recent VAD and it was later revealed that he also had a renal artery dissection. The current clinical history reports numerous important risk factors for vascular disease and stroke including: a connective tissue disorder, smoking, alcohol and substance abuse. It is likely

that these were also present at the first stroke event six years ago. It is also disclosed late in the case report that the patient had a connective tissue disorder, which makes the patient highly vulnerable to arterial wall weakness and vascular disorders.[44,45]

The patient received follow-up care at another hospital until the current evaluation, when he presented to the emergency department of this hospital with 3 days of severe pain on exertion that affected the left side of the neck and left temporo-occipital region.

**TABLE 1 – Timeline of events**

	<b>2015</b>	<b>1 month later</b>	<b>Current /2021</b>
<b>Symptoms</b>	Head and neck pain	Decreased HA	Severe head and neck pain
	Facial numbness	Persistent NP	Similar to 2015 presentation
	Dizziness	Balance difficulty	Flank pain
	Decreased sensation	Decreased sensation	Tendency to bruise
<b>Vascular risk factors</b>	Not reported	Not reported	Raised IgM phospholipids
			Raised triglycerides
			Raised ESR
			Smoking
			Cannabis use
			Hypertension 176/119
<b>Diagnosis</b>	Not reported	Not reported	Ehlers Danlos Syndrome
<b>Tests</b>	CT scan revealed cerebral infarct.	MRA revealed persistent cerebral infarct	CTA and MRA revealed VAD
	No dissection or aneurysm detected		CT Abdomen-renal artery dissection
<b>Treatment</b>	Aspirin and discharged	Monitoring	Medical management of Ehlers Danlos Syndrome

KEY: HA = headache, NP= neck pain, CTA= CT angiography, MRA = MR angiography

## DISCUSSION

This case report omitted important clinical information and may have led to a false interpretation of causation to a chiropractic treatment reported by the discussion. In particular (as discussed previously), the case report had very limited discussion of the past chiropractic involvement and little of the significant risk factors and multiple hospital presentations associated with the vascular events and their lack of appropriate

management. Rather, it appears blame is assigned to the chiropractic intervention in a vacuum of responsibility for the other management of this case.[46]

Several studies have assessed the risk of CAD and chiropractic SMT. Cassidy found 818 VAD strokes hospitalized in a population of more than 100 million person-years. In those aged >45 years, cases were about three times more likely to see a chiropractor or a primary care physician (PCP) before their stroke than controls. [28] There was no increased association between chiropractic visits and VAD stroke in those older than 45 years. Positive associations were found between PCP visits and VAD stroke in all age groups. Practitioner visits billed for headache and neck complaints were highly associated with subsequent VAD stroke. Cassidy concluded:

*“VAD stroke is a very rare event in the population. The increased risks of VBA stroke associated with chiropractic and PCP visits is likely due to patients with headache and neck pain from VBA dissection seeking care before their stroke. We found no evidence of excess risk of VBA stroke associated chiropractic care compared to primary care”.*

Micheli concluded on emerging risk factors for CAD:[42]

*“... in the absence of randomized trials, the best current evidence suggests that cervical artery dissection, especially vertebral artery dissection should be considered as a random and unpredictable complication of any neck movement including cervical manipulation. Thus, a significant increase in pain, especially when associated with focal neurological signs following spinal manipulative therapy warrants immediate medical evaluation.”*

Wynd conducted a systematic review assessing the quality of studies on SMT for CAD.[30] Their study concluded that the literature infrequently reports useful data toward understanding the association between chiropractic SMT, CADs and stroke. Improving the quality, completeness, and consistency of reporting adverse events may improve our understanding of this important relation. For example, in only 10% of case reports they reviewed, was the presence of neck pain or headache reported. Yet, this is the most commonly reported first symptom of VAD. In addition, in only 9% of case reports were co-morbidities (such as smoking, hypertension, migraine, etc) reported. Unfortunately, in only 6% was the location of the injury in the vertebral artery reported. These are clear weaknesses in the 2021 Lindsay case report.

Church (2016) also conducted a systematic review of SMT for CAD.[27] They concluded that whilst the quality of the published literature on the relationship between chiropractic manipulation and CAD is very low, their study showed only a small association between chiropractic SMT and CAD. They postulated the relationship may be explained by the high risk of bias and confounding in the available studies, and in particular by the known association of neck pain with CAD and with chiropractic manipulation. They also

concluded there was no convincing evidence to support a causal link between chiropractic manipulation and CAD.

Significant issues still remain unknown in this case report. For example, was the connective tissue disorder present six years ago? What was the patient's drug use (both illicit and prescription)? Did the patient have continuing neck pain and headache for the six-year interval between hospital admissions? Had they sought treatment for these issues in the last six years?

It was reported they had received knee surgery, which may have caused them to use NSAIDS for a prolonged time? NSAIDS have been reported to cause stroke.[40,47] Had they sought treatment for their hypertension, dyslipidaemia, or renal issues in the last six years? The case report made no comment on the patients smoking, alcohol and marijuana issues, and any connection with mental health problems or use of antidepressants. Antidepressants have been reported to cause intracranial haemorrhage.[48,49]

## **CONCLUSION**

There is clear evidence that a connective tissue disorder (Ehlers-Danlos syndrome) is the most likely cause of the patient's stroke reported in the paper of Lindsay et al (2021). There was no need for any discussion regarding chiropractic treatment, as there was also clear evidence that SMT did not cause a VAD on the first presentation of the patient six years prior.

Clinicians should always note significant risk factors that could inform of appropriate diagnosis and management. The notation of risk factors (especially a connective tissue disorder) may have precluded the chiropractic manipulation in the first instance, as it may be a contraindication to manipulation. Yet, in the absence of this information, the manipulation was suggested to cause the VAD. Case reports are not research and cannot infer causality, only association. Here it is clear that the association of the manipulation with the adverse event was inappropriate especially in the absence of critical clinical information.

Most VAD stroke is spontaneous with no obvious cause, which is why a thorough history assessing all potential signs and symptoms must be performed. A more likely interpretation of this case report appears to be a spontaneous VAD due to a connective tissue disorder (Ehlers-Danlos syndrome) with a resultant vasculopathy.



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